

Thick Skin

(1)

Present in palms & soles. Formed of:

I. Epidermis

= Keratinized str. sq. epith. Formed of Keratinocytes & Non-Keratinocytes.

[A] Keratinocytes

= 85% of cells of epidermis, form Keratin. 5 layers:

1. Basal Cell layer = Stratum basale = germinal L.

L.M. 1 layer of Columnar cells, resting on a clear & wavy basement memb.

- Have basal oval nuclei w show mitotic figures for renewal w takes place every 2-4 weeks mostly at night. & basophilic cytoplasm

- Melanocytes + Merkel's cells are present in this layer.

E.M. - Cells are joined together by desmosomes & to b.m. by hemidesmosomes.

- rich in ribosomes & polysomes - have intermediate filaments = Tonofilaments (prekeratin) in bundles w end in desmosomes.

2. Spinous layer = Str. spinosum = Prickle cell L.

L.M. 4-8 layers of polyhedral cells e' central rounded nuclei w show mitotic figures & less basophilic cytoplasm. They have spine-like processes indicating sites of desmosomes as cells shrink during preparation

- Langerhan's cells are present in this layer.

E.M. Tonofilaments in bundles w end in desmosomes + interdigitating cell membs.

(N.B) Malpighian layer includes: basal layer + spinous layer: both show mitotic figures.

3. Granular layer = Str. granulosum:

L.M. - 3-4 layers of spindle-shaped cells e' flat nuclei & basophilic granules.

E.M. - 2 types of granules:

(a) Coated lamellar granules:

- covered by membrane.

- contain lamellar discs = lipid bilayers. their content form lipid sheets to act as → cement (have sealing effect) & act as barrier.

(b) Keratohyaline granules:

large bodies not covered by membs, contain pns e' many phosphate groups so, basophilic by L.M.

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4. Clear Layer = Str. Lucidum:

(2)

L.M. thin, homogenous clear layer = flattened cells, Nuclei start to disappear. [Karyolysis]

E.M. - thick cell membs. joined by remnants of desmosomes.

- Nucleus & organelles disappear (lysosomal activity)
- closely packed filaments of eleidin = immature Keratin embedded in the dense matrix formed by the Keratohyaline granules.

5. Horny layer = Str. Corneum:

L.M. thick acidophilic layer of scales of Keratinized dead cells.

E.M. - bags of Keratin & no nuclei or organelles

- filled & mature Keratin filaments embedded in amorphous matrix.
- their thick cell membs. are joined by remnants of desmosomes.

[B] Non-Keratinocytes

1. Melanocytes:

Origin: ectodermal. Site: just under or bet. cells of basal layer.

L.M.: have rounded cell bodies & pale rounded nuclei. cannot be seen by H&E.

- have long processes w̄ extend bet. Keratinocytes. The tips of their processes end in invaginations in cells of Malpighian layer. Give Dopa +ve reaction

E.M. Have euchromatic nucleus & prominent nucleolus.

- characters of ptn. forming cells i.e. many mit., rER & well developed G.A.
- No desmosomes bet them & Keratinocytes but joined to b.m. by hemidesmosomes
- have granules called melanosomes.

Functions:

1. form tyrosinase enz. essential for melanin formation.

2. melanin granules lie above the nucleus to protect DNA from UVRs (by scattering them)

[N.B] Dopa Reaction:

Fresh section of skin is incubated & DOPA. Tyrosinase in melanocytes convert DOPA into melanin. Importance: to distinguish bet. melanocytes & melanophores
↳ count melanocytes / area of skin.

Steps of melanin synthesis in melanocytes:

1. synthesis of tyrosinase starts in rER & completed in G.A.
from w̄ vesicles bud off & called melanosomes.
2. After complete formation of melanin in " ", the granules lose tyrosinase → melanin granules w̄ migrate to the tip of the cytoplasmic processes.

2] Merkel's Cells:

Origin: ectodermal.

L.M. modified basal cells. Naked sensory nerve fibres end in disc like expansion under these cells → Merkel cell-neurite complex.

E.M. attached to adjacent cells by desmosomes - invaginated Nucleus.
- cytoplasm contains → electron-dense granules like neuro-endocrine cells [APUD cells]
↳ cytoKeratin filament (differ from those of Keratinocytes).

Functions: 1. mechanoreceptor for press.
2. granules → paracrine regulation of epidermal cells.

3] Langerhans Cells: [3- 8 % of epid. cells]

Origin: stem cells in b.m → dermal bl.vs → epidermis [Mesodermal].

L.M. stellate cells bet. cells of spinous layer
have dark N. & pale cytoplasm.
stained by **Vital stains**.

E.M. 1-ry & 2-ry lysosomes + well developed G.A. + multivesicular bodies.

- **Birbeck's granules** = tennis-raquet-shaped e' Non-clear function may contain hydrolytic enzs. Irregular Nucleus

- No melanin granules, No Keratin, No desmosomes & no junctions e' Keratinocytes.

Function: 1. Act as antigen presenting cells: present antigens w contact skin to T-cells so play a role in allergic or immunological reactions.
2. may control cell division in epidermis.

Color of skin: depend on:

1. Hb. in bl. caps. of skin (red).
2. Carotene pigment (yellow).
3. Melanin pigment (brown to black).

Clinical Applications:

- UVRs speed tyrosinase synthesis → ↑↑ melanin formation.
- Epidermis is translucent esp. in light skinned persons, So, pale in anemia, blue in heart or lung dis. e' low O₂ in bl. & pink while flushing.
- Albinism: absence of melanin due to genetic defect in tyrosinase synthesis
- Psoriasis: skin disease e' ↑ proliferation of cells of Malpighian layer
→ ↑ epidermal thickness & abnormal Keratinization. → defective skin barrier.

II Dermis

C.T. under epidermis = 2 layers.

-4-

Papillary layer	Reticular layer
- thinner & superficial. - Formed of loose c.t. - more cellular $\left\{ \begin{array}{l} \text{Fibroblasts + fat cells} \\ \text{macrophages + mast cells} \\ \text{lymphocytes.} \end{array} \right.$ - Fine c.t. fibres $\left\{ \begin{array}{l} \text{type III collagen} \\ \text{elastic fibres} \end{array} \right.$ - More vascular - Receptors : Meissner's Corpuscles	- thicker & deeper. - dense c.t. - less cellular - collagenous bundles [type I collagen] - elastic fibres. - less vascular - Pacinian Corpuscles + Krause end bulb + Ruffini end Organ.

Factors Fixing epidermis to dermis :

1. basement memb. of epidermis.
2. hemidesmosomes bet. basal cells & b.m.
3. dermal papillae interdigitating w/ epidermal ridges (pegs)

Dermo-epidermal Junction :

Zigzag like interdigitations bet. dermal papillae & epidermal ridges.

F. : 1- provide attachment of epidermis to dermis.

2- ↑ surface area for nutrition of epidermis.

* Wrinkling of skin is due to atrophy of elastic fs. of c.t. dermis.

Rapid stretch of skin → rupture of fibres in the dermis → scar tissue → white lines. In pregnancy = linea gravidarum.

Functions of skin :

1. protection : act as barrier against $\left\{ \begin{array}{l} \text{U.V. rays (by melanin)} \\ \text{trauma, infection, dehydration (by Keratin)} \end{array} \right.$
2. sensory organs (receptors)
3. regulate body temp. (sweat + A-V. shunts)
4. excrete waste products & H₂O (sweat gls).
5. synthesis of vit. D.
6. medico-legal (finger prints)
7. diagnosis of some diseases. e.g. measles, chicken pox, anaemia, jaundice, age, cirrhosis.

Thick skin	Thin skin.
Sites :- Palms & soles - tips & sides of fingers & toes	- the rest of body.
Epidermis - thick - thicker Malpighian L. - thicker Granular L (2-4 Ls) - Clear L present - thick Horny L.	- thinner. - thinner. - thinner (1 L) - absent. - thinner.
dermal papilla - regular, numerous, high	- few, irregular, small
Appendages hair follicles arrector pili ms } absent sebaceous gls. } More numerous sweat gls	- present. - less numerous.

N.B. the thinnest skin in our body is in eyelid.

[Epidermal Stem Cells] ES cells.

def. :- the Follicular bulge is a region at the upper part of ext. root sheath where the arrector pili muscle is inserted. & an aggregate of undifferentiated epith. cells ES cells resides.

They do not contribute to basal stem cells of epidermis.

Function:

- Normally, ES cells → growth of hair follicles + sebaceous gls.
- If epidermis is injured or lost, ES cells migrate towards the wound surface for the initial healing of the wound.

Skin Appendages

(6)

A. Hairs

def: Keratinized oblique epithelial thread inserted into epidermal sheath = hair follicle.

Structure: modified part of Horny layer. Formed of:

1. Shaft: the part projecting above skin surface.
2. Root: " " embedded in the " inside the follicle.

both shaft & root are formed of:

- a. medulla = Soft Keratin.
- b. cortex = hard " contain melanin
- c. cuticle = hard "

3. Hair Follicle = downgrowth of epidermis around the " root of the hair
formed of 3 sheaths:

* Inner root sheath: 3 layers.

- Cuticle = scales rich in soft Keratin.
- Huxley's Layer
- Henle's " } from inside outwards.

* Outer root sheath:

- downward continuation of epidermis
- At bottom = basal layer only.

* C.T. sheath: c.t. dermis.

* the outer root sheath is separated from c.t. sheath by thick basal lamina
Glassy "memb."

(N.B) Hair bulb

- = terminal dilatation of the hair follicle
- invaginated by vascular c.t. from dermis "hair papilla"
- contain melanocytes + matrix cells for growth of hair.

Colour of hair:

caused by melanin pigment in the cortex produced by melanocytes in hair matrix

Grey hair: in old age melanocytes fail to produce tyrosinase.

Yellow hair: due to pheomelanin (yellow)

Baldness: hair loss due to genetic factors & sex hrs. mainly in ♂

Arrector Pili Muscle

Smooth muscle: origin: papillary layer of dermis. insert?: c.t. sheath

It's contraction: (fear, cold = symp) → erection of hair, depression of skin (goose)
skin

C. Nails

def: plates of Keratinized epith. cells on dorsum of distal phalanx.

formed of: Nail plate + free edge + root (in nail groove, covered by nail fold)

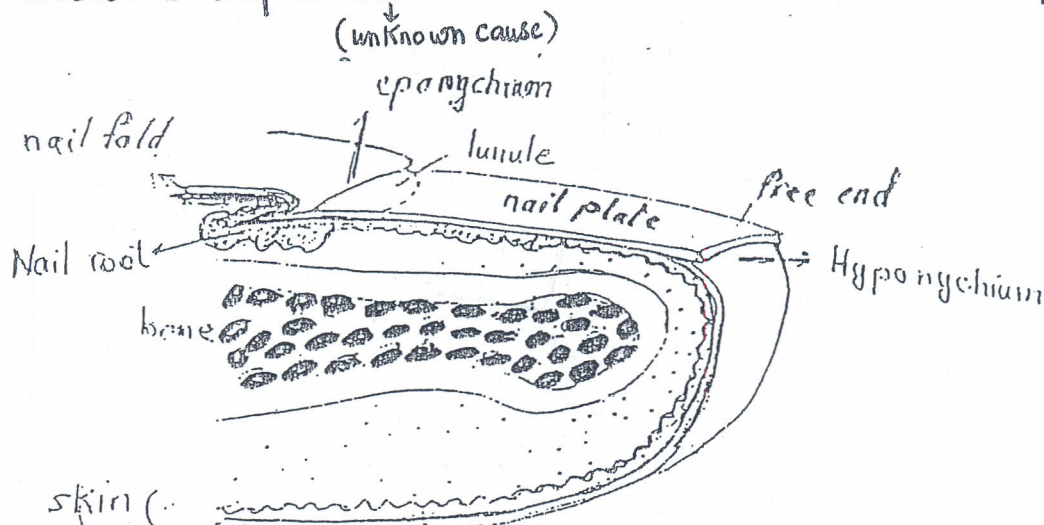
Proximal nail fold: skin fold w covers the root = **eponychium** or cuticle.

Lateral " ": 2 skin folds that cover the lat. sides of the nail.

Nail bed = area under the nail plate $\rightarrow$ epidermal cells = thin **Malpighian L.** (sterile matrix)
 $\downarrow$ **dermis**: highly vascular e' no papillae.

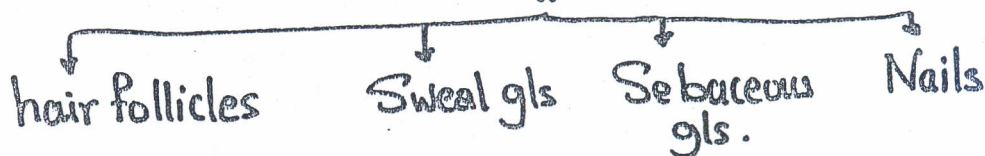
Nail Matrix: Malpighian cells lining the nail groove from w the nail grows.

Lunule: crescent-shaped white area at the base of the nail plate.



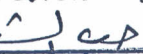
Nail

Integument = skin + Appendages



B) Glands of Skin

a. Eccrine sweat gls Sweat glands b. Apocrine sweat gls

Type	Simple coiled tubular gland		sebaceous gl.
Mode of secretion	- Merocrine (by exocytosis)	- Apocrine (apex lost e' secretion) exocytosis is merocrine (misnamed)	Holocrine: whole cell die & lost e' secretion (lysosome)
Site	All over the body except in glans penis & nail bed more in thick skin.	- thin skin of axilla, pubic & perineal areas.	- associated e' hair follicles. rarely about hairs: eye lid
Acini	Smaller e' narrow lumen  - lined e' 1 layer of cuboidal cells surrounded by myoepith. cells <u>2 types</u> (1) Large pale [Clear] cells  - more numerous - broad base & narrow apex - pale cytoplasm (glycogen) - intercellular canaliculi present bet them (2) Small dark cells. - less - narrow base & broad apex. - dark granular Cyt. (glycoprotein) ^{PER} GA	Larger e' wider lumen  - lined e' 1 layer of cuboidal cells surrounded by myoepith. cells	1 or 2 pear-shaped alveoli  - lined e': 1. basal flat stem cells to replace 2. central polyhydral cells e' central nuclei & vacuolated cyt. (fat)
Ducts	Spiral course in epidermis & open into * epidermis * hair follicle - lined e' 2 layers of cubical cells in epidermis it is just spaces bet. epid. cells.		Short, open into upper 1/3 of hair follicle - lined e' st. sq. continuous e' the out. root sheath.
Function	→ Clear watery sweat [H ₂ O + NaCl + urea + ammonia]	- Viscid milky sweat rich in ptn. Odourless ^{bact} _{decomposition} → offensive odour Function at puberty	→ secrete sebum (oily) - prevent cracking of skin - anti bact & anti fungal * disturbed secretion → acne 

B) Glands of Skin

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1 Type	Simple coiled tubular gland		Simple or s. branched alveolar
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